LIMITS TO URBAN GROWTH:

THE CASE OF MUMBAI

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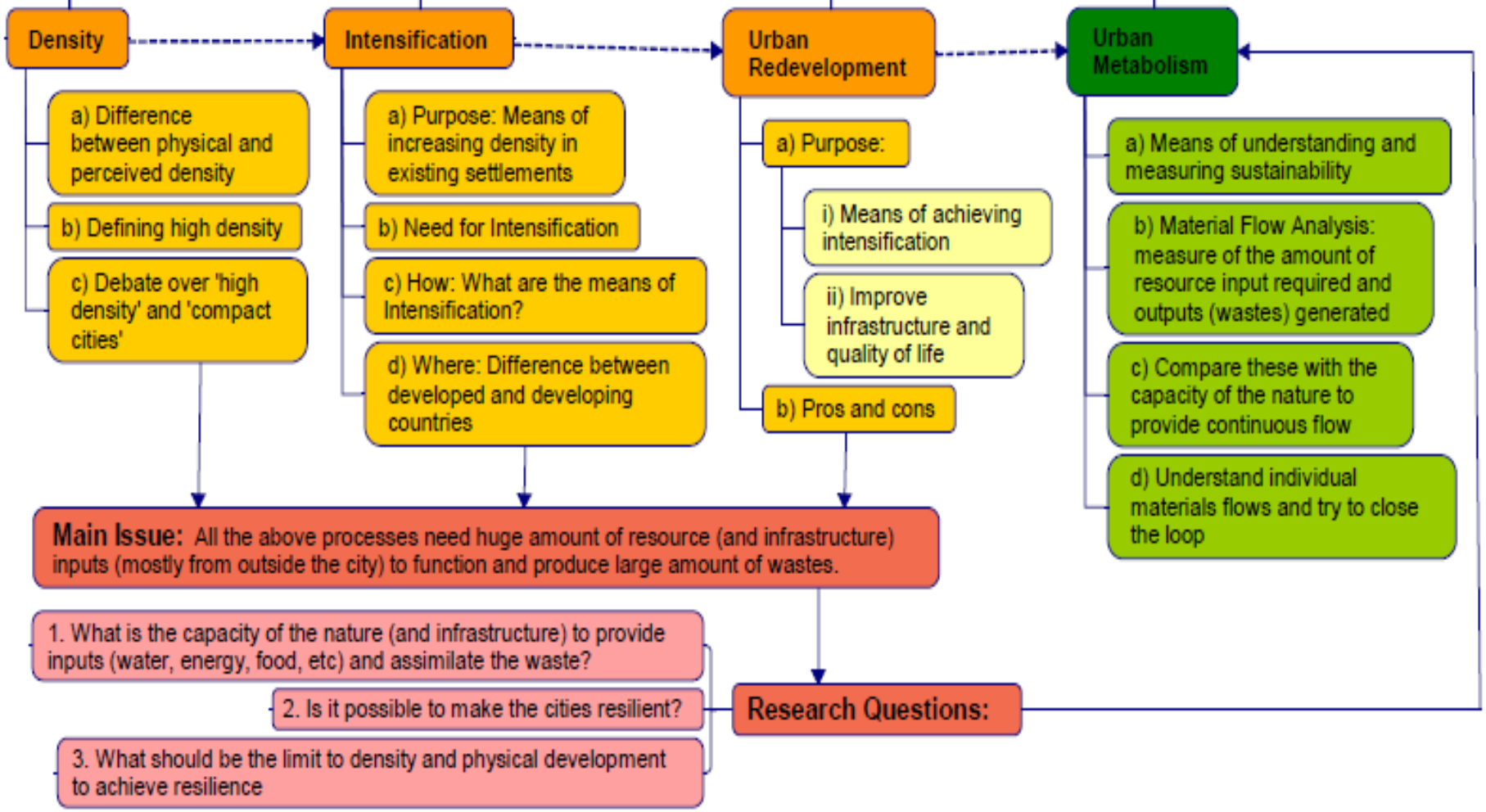
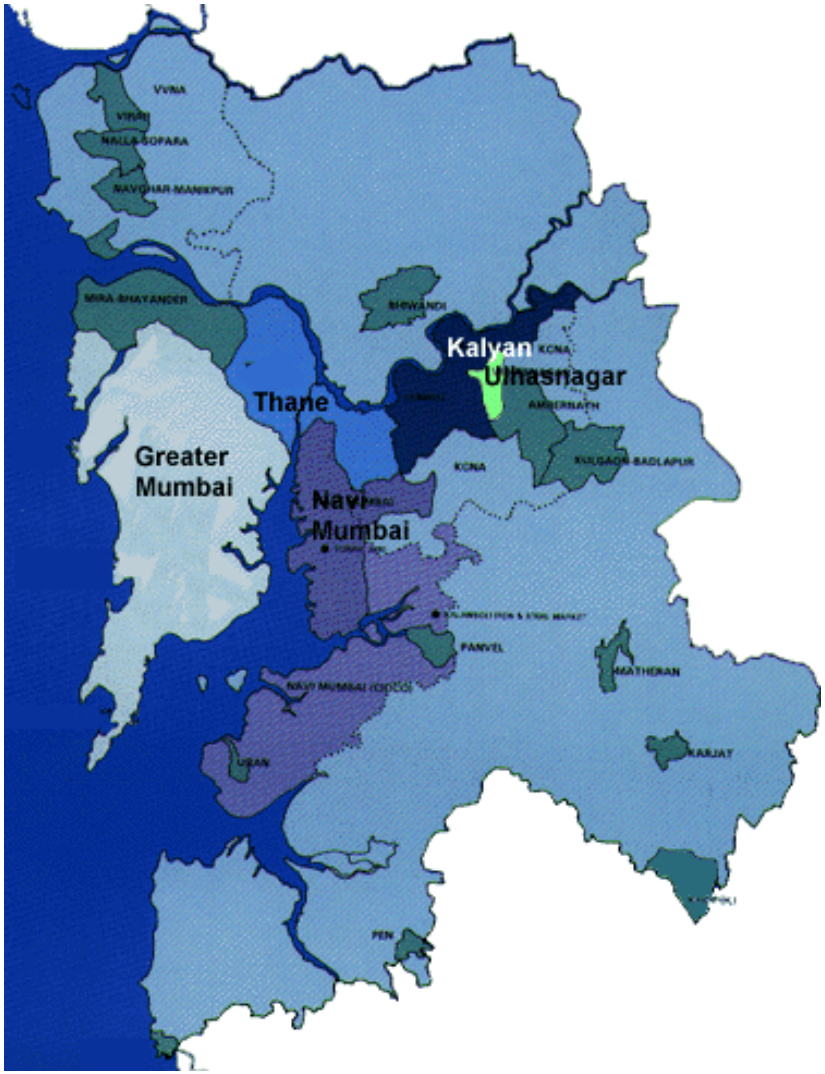
Te Whare Wānanga o Tāmaki Makaurau

Conceptual framework



Case Study – Mumbai, India



Mumbai Metropolitan Region
Area: 4355 sq. km
Population 18.4 million
Density = 4225 per sq. km

Greater Mumbai
Area = 524.95 sq. km
Population = 12.5 million
Density = 23,812 per sq. km

Rest of MMR

Mumbai City district
Area = 78.48 sq. km
Population = 3.2 million
Density = 40,775 per sq. km

Mumbai Suburban District
Area = 446.47 sq. km
Population = 9.3 million
Density = 20,830 per sq. km

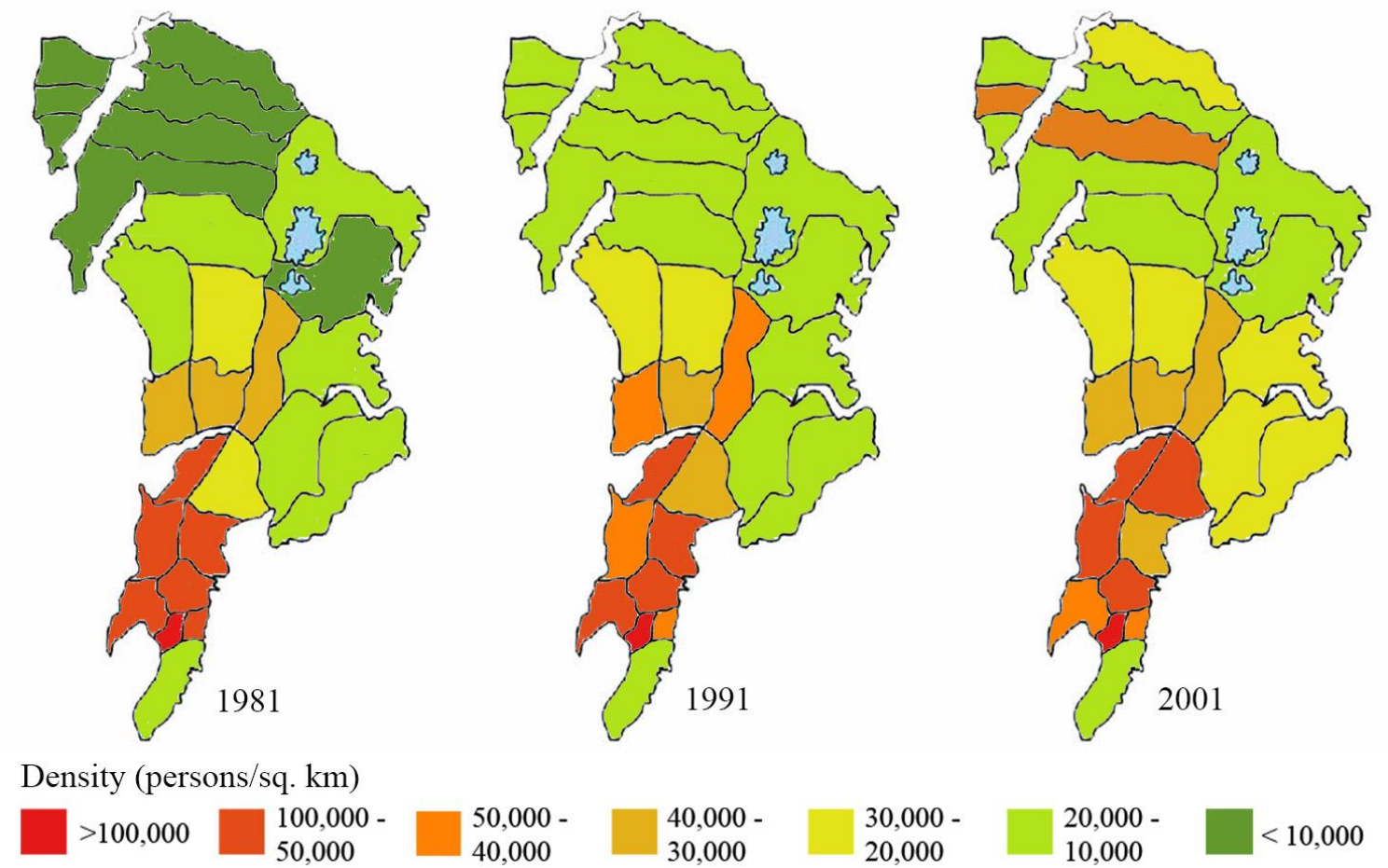
7-wards
(A to G)

9 wards
(H to T)

Source: (MCGM, (2005 to 2025))

MCGM. ((2005 to 2025)). Chapter 1: Mumbai (1-2. Regional Setting) *Greater Mumbai City Development Plan*. Mumbai.

Density Distribution



Changing population density in different administrative wards of Greater Mumbai (1981–2001) Source: Data derived from *Wendell Cox Consultancy, (n.d.) ; MCGM (2012)*

- Wendell Cox Consultancy, (n.d.) *Mumbai: Population, Area & density by ward 1991 and 1981*. Retrieved from http://www.demographia.com/db-mumbaiward91.htm
- MCGM. (2005 to 2025). *Greater Mumbai City Development Plan*. Mumbai: Retrieved from http://www.mcgm.gov.in/irj/portal/anonymous?NavigationTarget=navurl://095e1c7b9486b1423b881dce8b106978

High Density & Compaction - in developed countries

- High density / compact cities = sustainable

- Perceived advantages include:
  - Saving agricultural and other valuable lands
  - Efficient land-use and infrastructure
  - Reduced energy consumption
  - Effective use of public transport
  - Better access to facilities and amenities
  - Increased opportunity for walking/cycling
  - Better recycling of household wastes
  - Positive relation with amount of open spaces and parks
  - more employment opportunities

High Density & High Rise- in developing countries

In addition to the afore mentioned advantages,

- Necessary to accommodate the increasing urban population – upward or outward
- Socially acceptable

'People's satisfaction with housing has little connection with height and density – "It is other features of the housing environment, rather than height, that result in different degrees of satisfaction".

(Zhang, 2000, p. 251)

Zhang, X. Q. (2000). High-Rise and High-Density Compact Urban Form. In M. Jenks, & R. Burgess (Eds.), *Compact cities : sustainable urban forms for developing countries* (pp. xi, 356 p.). London: Spon.

Research Questions

How dense is dense enough?

And by implication,

How high is high enough?

The Vision Statement for Mumbai

"Transforming Mumbai into a World Class city with a Vibrant Economy and Globally Comparable Quality of Life for its Citizens."

(Source: http://www.visionmumbai.org/)

Six key areas of focus:

1. Boost economic growth
2. Improve and expand transportation
3. Increase housing
4. Other infrastructures
5. Financing
6. Governance

Zhang, X. Q. (2000). High-Rise and High-Density Compact Urban Form. In M. Jenks, & R. Burgess (Eds.), *Compact cities : sustainable urban forms for developing countries* (pp. xi, 356 p.). London: Spon.

Background: Redevelopment of “Cessed Properties”

Initial Problem identified by the Govt.:

- Increasing population and insufficient Housing
- Dilapidated condition of existing housing stock (around 16289 building covering an area of about 59.41 sq km)
- Very low per person floor space : 2.9 sq. m of floor space per person or 150 sq ft units avg.

Solutions Proposed:

- Provide additional FSI to encourage redevelopemnt of 'Cessed buildings'
- Set the minimum floor space per dwelling at 300sq ft.

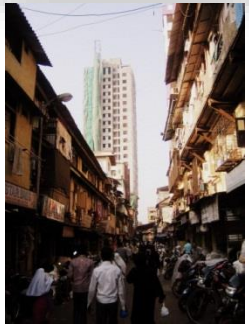
Results:

- Tall stand-alone buildings replacing medium rise buildings
- Increased population density in already high density areas
- Increasing pressure on existing infrastructure, without any improvements to its condition
- No consideration to the socio-economic impact on the area









Background: Cluster Redevelopment

Proposed Solution:
Cluster Redevelopment

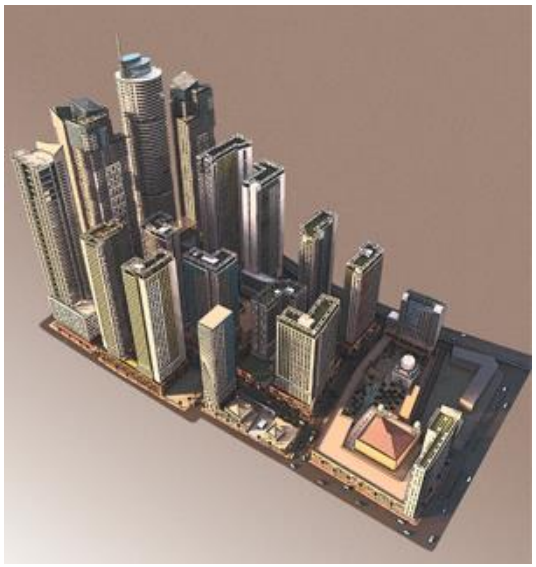
- Higher FSI to larger cluster redevelopment proposals compared to individual buildings/lots

Expectations:

- Cohesive planning and upgrading infrastructure, i.e., wider streets, new pipelines, more open/recreational spaces and other amenities

Problem anticipated:

- Even greater increase in population density = increased demand for resources
- Localized improvement of infrastructure, without easing the over-all burden



Bhendi Bazaar
(4450 tenements - 6.67 Hectares)

Chira Bazaar
(8800 tenements – 12.14 Hectares)

Specific Questions

Is it sufficient to provide housing without the supporting infrastructure?

or

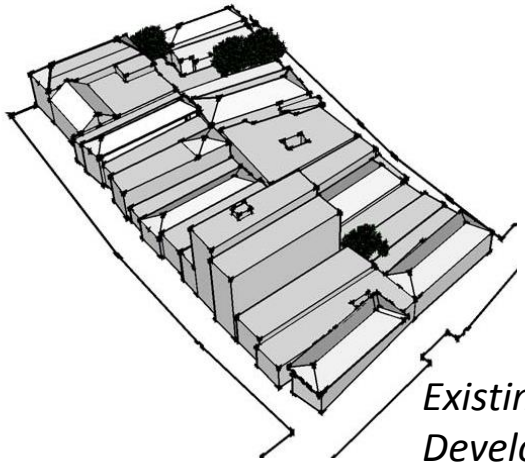
Even if adequate infrastructural capacity was developed, are there adequate resources to sustain the city if these developments are replicated widely as planned?

or

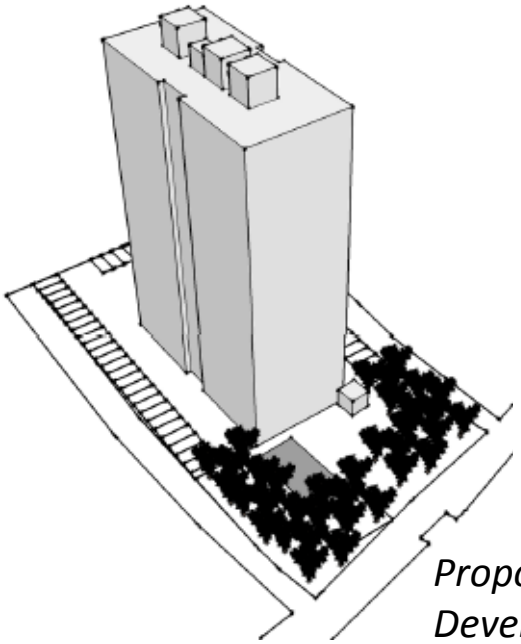
How resilient would the proposed developments be in the long run, when faced with resource shortages or climate change?

Preliminary study

Comparison of Existing and Potential Redevelopment



Existing Development

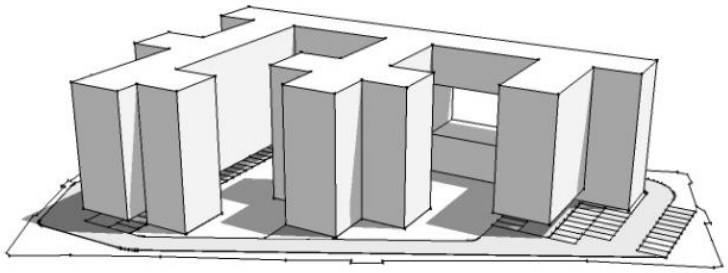


Proposed Development

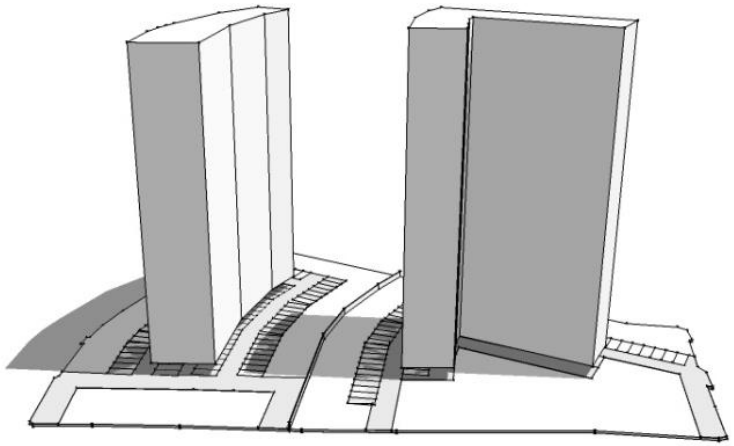
	Existing	Potential
Land Area	3725 sq. m	3725 sq. m
FSI	1.705	4.34
Built-up Area	6349.365 sq. m	16181.88 sq. m
	-	155% increase
Avg. Tenement Size	13 sq. m (140 sq.ft.)	27.8 sq. m (300 sq.ft.)
		47 sq. m (500 sq.ft.)
		75 sq. m (750 sq.ft.)
Population (approx.)	1030 people	1305 people
	-	27% increase
Density (population)	276,510 ppl/sq. km	350,335 ppl/sq. km
No. Of Storeys	2-6	30
Car Parking	< 10	35 - 80 (approx.)
Estimated CO_2 produced by Cars	>2340 Kg/year	8190 – 18720 Kg/year
	-	71% - 88% increase
Amenity Open Space	None	930 sq. m
Roof Area	3375 sq. m	385 sq. m (88.5% reduction)
Energy Consumption	-	50% increase
Water Use	-	80% increase
RWH potential	5811.2 m3	664.2 m3 (90% decrease)
No. of Trees	3-5	47
CO_2 Sequestering Potential	69–115 Kg/year	1081 Kg/year
	5-3 %	13-6%

Preliminary study

Comparison of Medium and High Rise Developments



Medium Rise Development



High Rise Development

Land Area		**10,000 sq. m**	
Proposed Built-up Area		29750 sq. m	
Open Space Required		1733 sq. m (20%)	
Population (approx.)		3814 persons	
Density (approx.)		381,400	
Estimated Water Requirement		125,289 – 320,185 m^3	
Car Parking		76 - 267	
Estimated CO_2 produced by Cars		17,962 – 63,103Kg/year	
No. of Trees (min. required)		87	
CO_2 Sequestering Potential		1993 Kg/year	
		11 – 0.5 %	
Type of development		**Medium Rise**	**High Rise**
No. Of Storeys		10	25
Roof Area		3264 sq. m (32.64%)	1311 sq. m (13.11%)
Total Rain Water Harvested		5,587.6 m^3	1,845.6 m^3
RWH potential		4.45 – 1.75%	1.47 – 0.58%
Open Space	paved	2884 sq. m (28.84%)	3208 sq. m (32.08%)
	unpaved	3852 sq. m (38.52%)	5460 sq. m (54.60%)

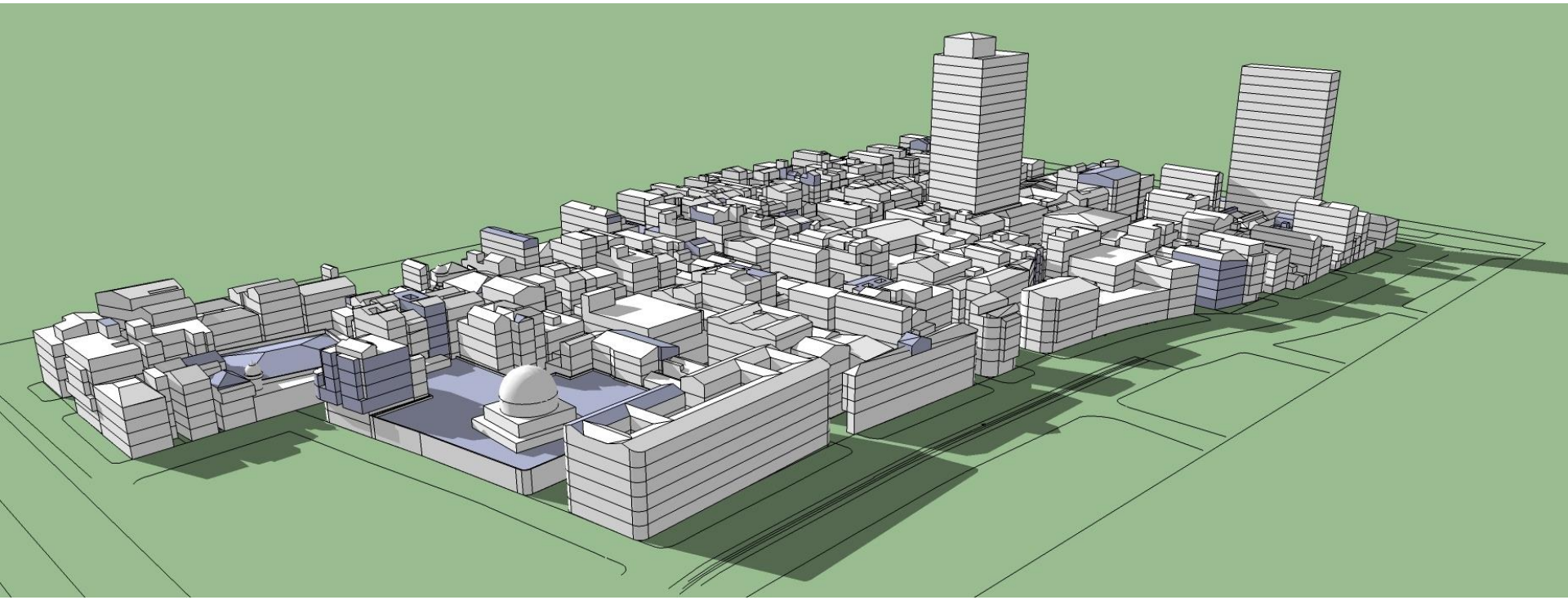
Case Study

Bhendi Bazar - consisting of 16.5 acres (6.677 hectares) area and 4450 existing tenements/units

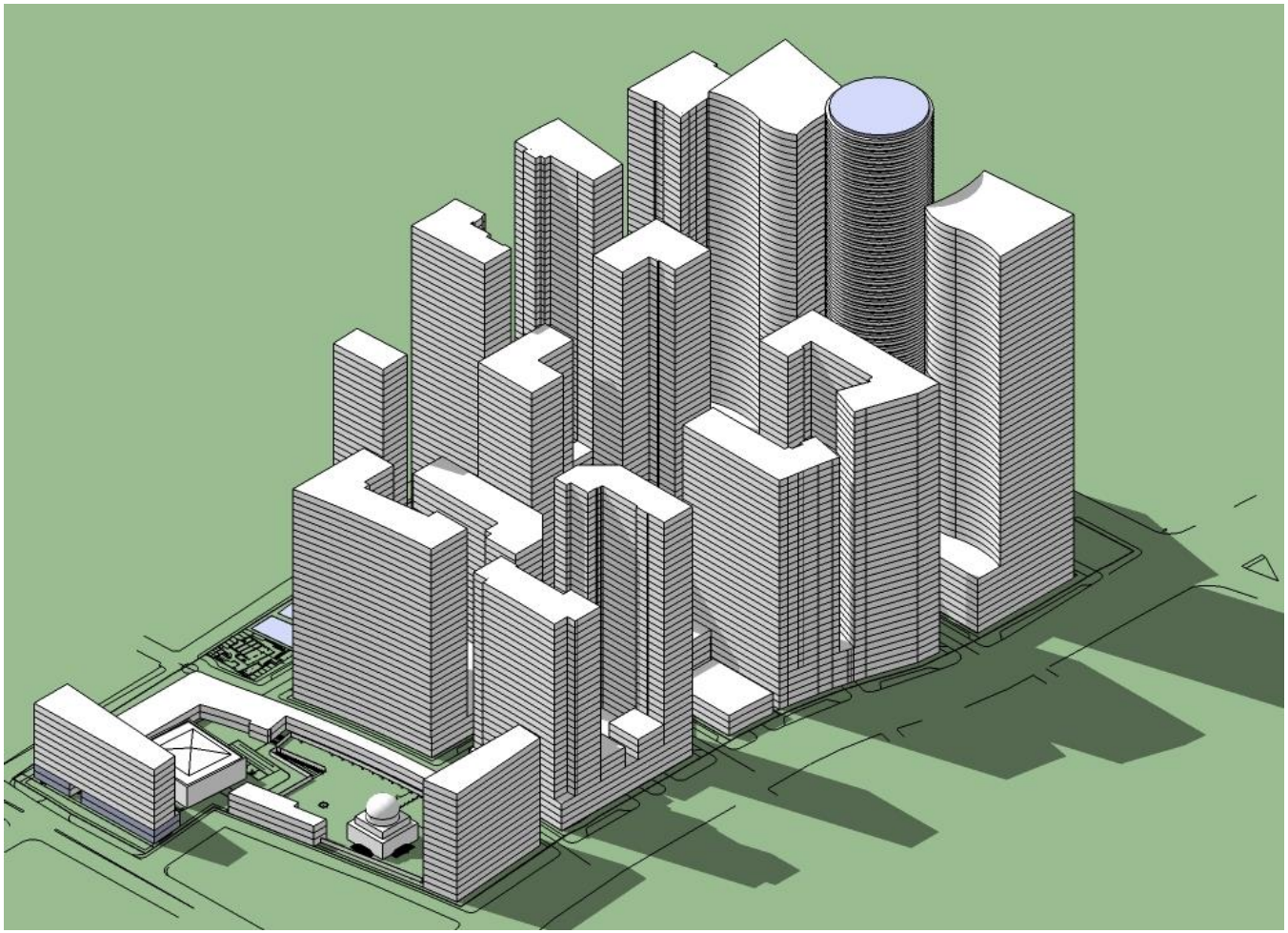
Existing layout

Proposed development

Case Study – Existing layout



Case Study – Proposed development



Case Study

	Existing layout	Proposed
Land Area	66,773 sq m	
Floor Space Index	2.67	4.84
Built up area	177,247 sq m	320,683 sq m
No. of buildings	250	22 towers (in 9 clusters)
No. of floors	4-6	Upto 40
Avg. Tenement Size	14-18.5 sq m (150-200 sq ft)	32.5 – above 70 sq m (350 – 750 sq ft)
No. of residential units	3,200	4,042
No. of commercial units	1261	1709
Total number of units	4869	5751
Total population	21,910	25,880
Approx. Population density	328,126 per sq km	387,581 per sq km
Car Parking	Almost nil (few on-street parking, mostly 2-wheelers)	60,000 sq m (underground & podium level car park for about 1400 vehicles)

Thank you